Metal, Nonmetal, or Metalloid?

Objective: Explore the physical and chemical properties of eight elements with the goal of classifying them as metals, nonmetals, or metalloids.

SAFETY CAUTION

Safety Precautions:
Perform this lab activity in a well-ventilated laboratory. Iodine is toxic by ingestion and inhalation; it is corrosive to the skin, eyes, and the respiratory tract; avoid inhalation of iodine vapors by keeping the iodine bottle covered throughout the lab. Hydrochloric acid solution is corrosive to eyes and skin. Cupric chloride solution is toxic if ingested. Avoid contact of all chemicals with eyes and all body tissues. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron.

Procedure:
Pre-Laboratory Preparation
1. Obtain small samples of the four elements, labeled A, B, C and D.
2. Make a hypothesis about what class of element (metal, nonmetal or metalloid) you think each element is based on how it looks.
3. Read through the lab and, on a separate sheet of paper, make a data table to record your results in.

Part 1—Physical Properties
1. Observe and record the *color* of each element on the Data Table. Is the sample silver, gray, colored, etc . . . .? Be very specific in recording observations.
2. Observe and record the *luster* of each element on the Data Table. Is the sample lustrous and shiny, slightly shiny, dull?
3. Record any other *physical properties* that are observed about the element on the Data Table. Be specific in your observations. What form is the sample in? Is the sample crystalline, flaky, rough, smooth, flat and plate-like, rocky, in strips?
4. Determine whether each element is *malleable* or *brittle*. To do this, strike a small sample of each substance with a hammer. A material is malleable if it flattens or bens without shattering. A sample is brittle if it shatters or cracks into pieces when struck. Record your results on the Data Table.
5. Test the conductivity of the eight samples. Touch both electrodes to the element being tested, being sure that the electrodes are not touching each other. Red LED off Green LED off Low or None, Red LED dim Green LED off Low, Red LED medium Green LED off medium, Red LED bright Green LED dim high, Red LED very bright Green LED medium very high

Part 2—Chemical Properties
1. Determine the *reactivity with acid* of each sample by placing a small amount of sample into a clean test tube and adding one pipetful (about 2-3 mL) of 1 M hydrochloric acid to each tube. **(Note: Evidence for a chemical reaction may be the formation of gas bubbles and/or discoloration on the surface of the element. Some reactions may be slow to start—be patient.)**

2. Observe each tube for approximately 3-5 minutes and record results in the Data Table.

Disposal:
Decant the liquid from the tubes into the sink while the water is running. Rinse out the tubes with water and put up to dry for the next class.

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Results:

Review the data gathered for the eight elements. Determine which of the elements were metals, which were nonmetals and which were metalloids. Make sure you use your data to back up your answers:

Element	Specific evidence that determined what class of element this element was.
A	
B	
C	
D	

Post Lab Write up:
1. Write a statement about what the objective of this lab was.
2. What were your hypotheses?
3. Include a clean, legible version of your data table.
4. Were your hypotheses correct or incorrect?
5. Include your results.